# Upper atmospheric researches using metadata database and data analysis software developed by the IUGONET project

AUTHOR(S):

SHINBORI, Atsuki; KOYAMA, Yukinobu; NOSE, Masahito; HORI, Tomoaki; OTSUKA, Yuichi; HASHIGUCHI, Noriko O.; HAYASHI, Hiroo; TSUDA, Toshitaka; IUGONET project team

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Metadata DB for Upper Atmosphere

超高層大気長期変動の全地球ネットワーク観測・研究

Inter-university Upper atmospheric Global Observation NETwork

JpGU@Makuhari, Chiba
MTI coupling in Asian sector
PEM08-30
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# Upper atmospheric researches using metadata database and data analysis software developed by the IUGONET project

**Atsuki Shinbori[1], Yukinobu Koyama[3], Masahito Nose[3], Tomoaki Hori[2], Yuichi Otsuka[2], Noriko O. Hashiguchi[1], Hiroo Hayashi[1], Toshitaka Tsuda[1], and IUGONET project team**

**[1]RISH, Kyoto Univ.**

**[2]STEL, Nagoya Univ.**

**[3]WDC, Kyoto Univ.**

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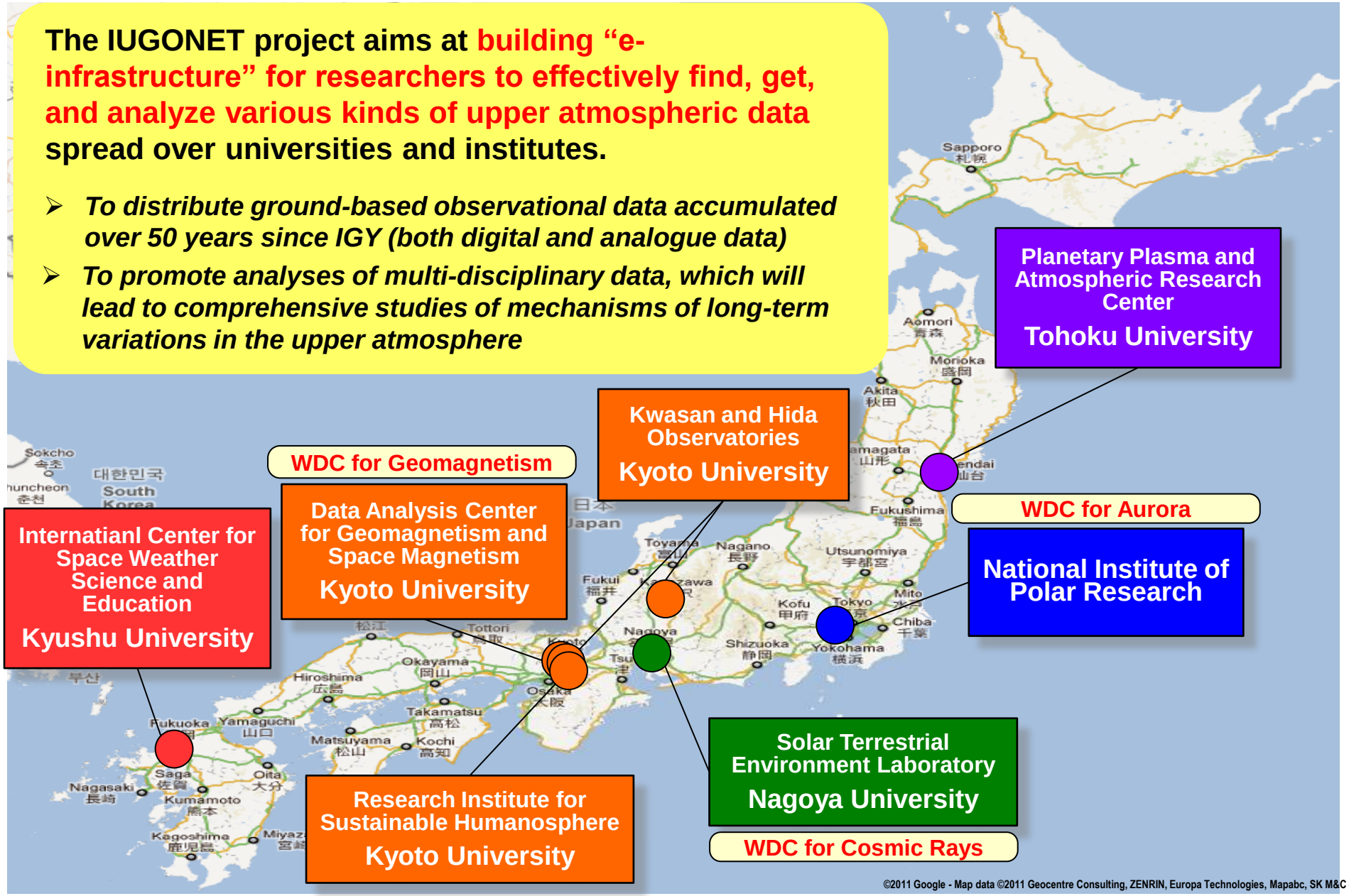
# 1. Introduction (Objective of the IUGONET project)

**The IUGONET project aims at building "e-infrastructure" for researchers to effectively find, get, and analyze various kinds of upper atmospheric data spread over universities and institutes.**

- ***To distribute ground-based observational data accumulated over 50 years since IGY (both digital and analogue data)***
- ***To promote analyses of multi-disciplinary data, which will lead to comprehensive studies of mechanisms of long-term variations in the upper atmosphere***



# 1. Introduction (IUGONET observation networks)

● Optical Observation ▲ Radar Observation ◆ Magnetometer Observation
■ Tohoku Univ. ■ NIPR ■ Nagoya Univ. ■ Kyoto Univ. ■ Kyushu Univ.

**Svalbard**
IS radar (EISCAT)
meteor radar
aurora imager


**Tromso**
IS radar (EISCAT)
meteor radar
MF radar

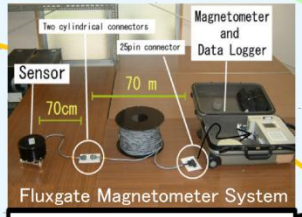
**Iceland**
aurora imager x2
magnetometer x3
ELF/VLF receiver
riometer

**Iitate and Onagawa Observatories**

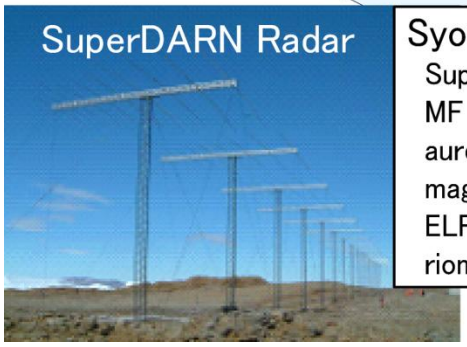

**SuperDARN**
Hokkaido HF radar

**Hida Observatory**
Solar Magnetic Activity
Research Telescope

**Equatorial Atmosphere Observatory**


**MAGDAS Observation Point**




**Syowa Station**
SuperDARN radar x2
MF radar
aurora imagers
magnetometer
ELF/VLF receiver
riometer

**Peru Ica University**


▲ MST radar
MF/meteor radar
◆ MAGDAS magnetometer
▲ FM – CW radar
● OMTI imager
◆ WDC magnetometer
— Magnetic Equator
(IGRF2005, Height 100km)

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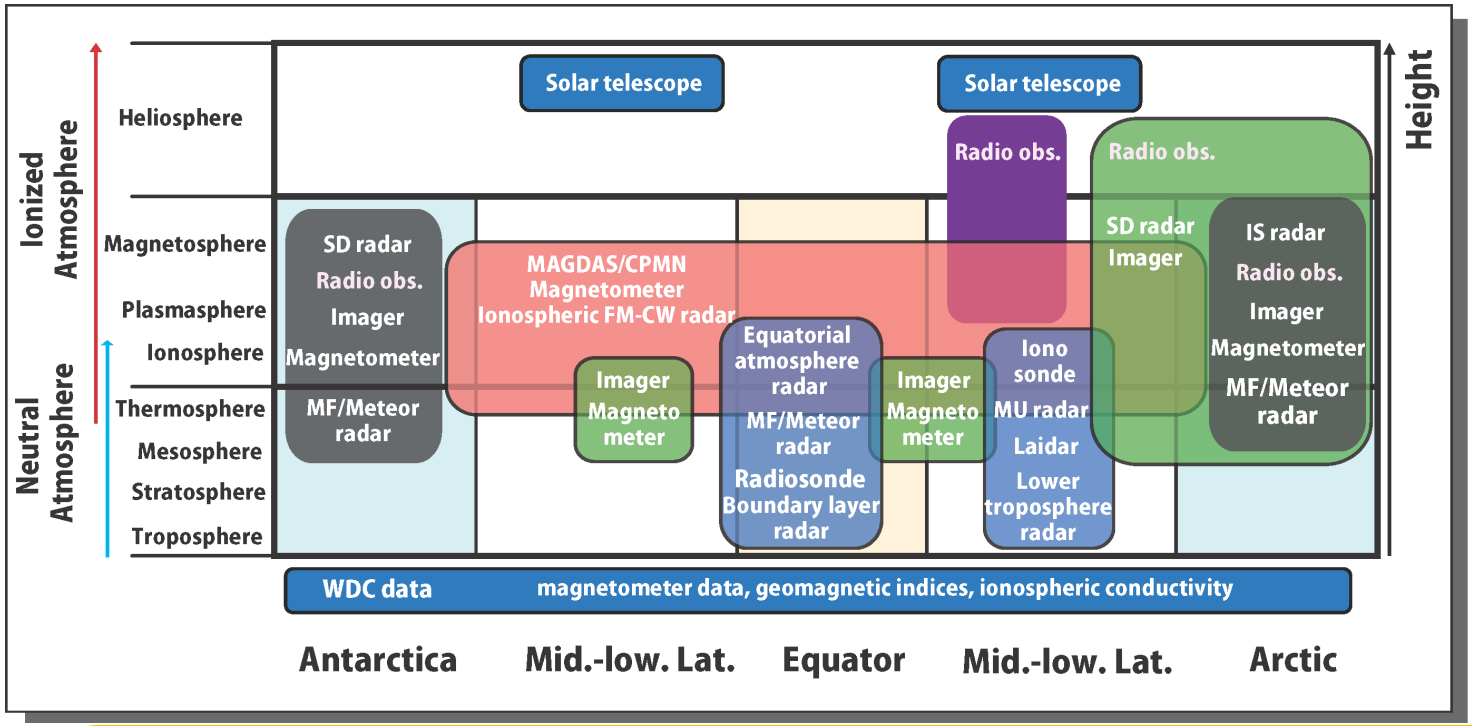
# 1. Introduction (Problems of data use )




- Tohoku Univ.
- NIPR
- Nagoya Univ.
- Kyoto Univ.
- Kyushu Univ.

**Various observation parameters (wind, geomagnetic field, aurora, sunspot etc.) taken by various techniques in various time periods at various locations and altitudes**

**Such observational data not necessarily well used in scientific researches so far**

➔ **PROBLEMS: databases dispersed, too little info, various data format, etc.**

**SOLUTIONS**

**1. Metadata database : to share info of data online and realize cross-search**
**2. Data analysis software : to help users quickly visualize and analyze data**

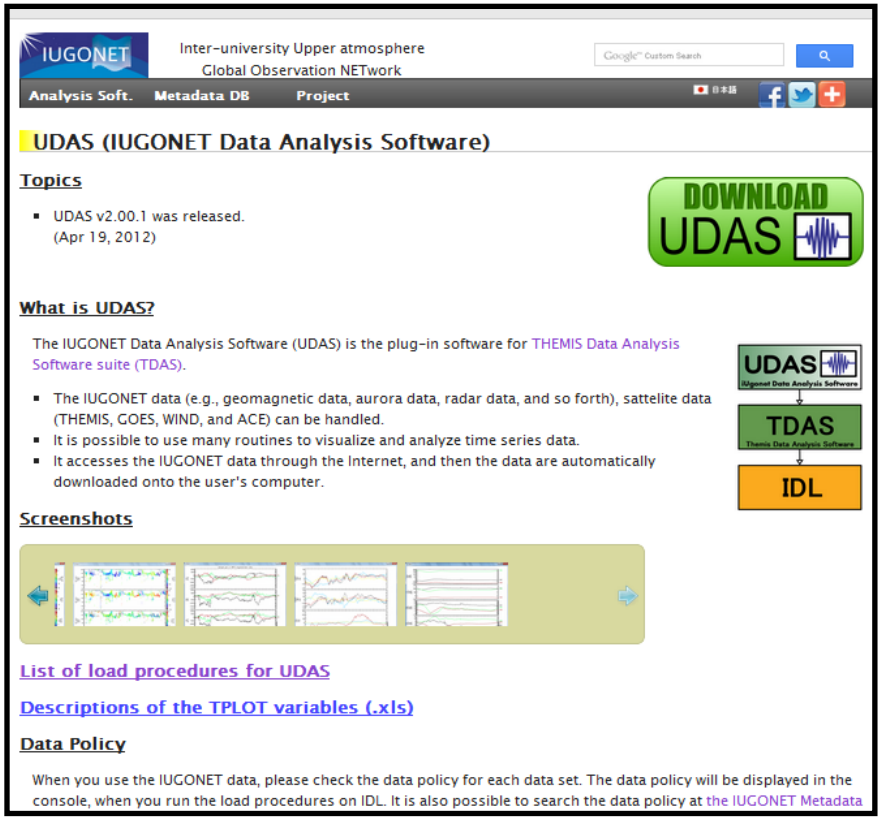
# 2. Main products by the IUGONET project

## 1. Metadata database

**http://search.iugonet.org/iugonet**


## 2. Data analysis software

**http://www.iugonet.org/en/software.html**



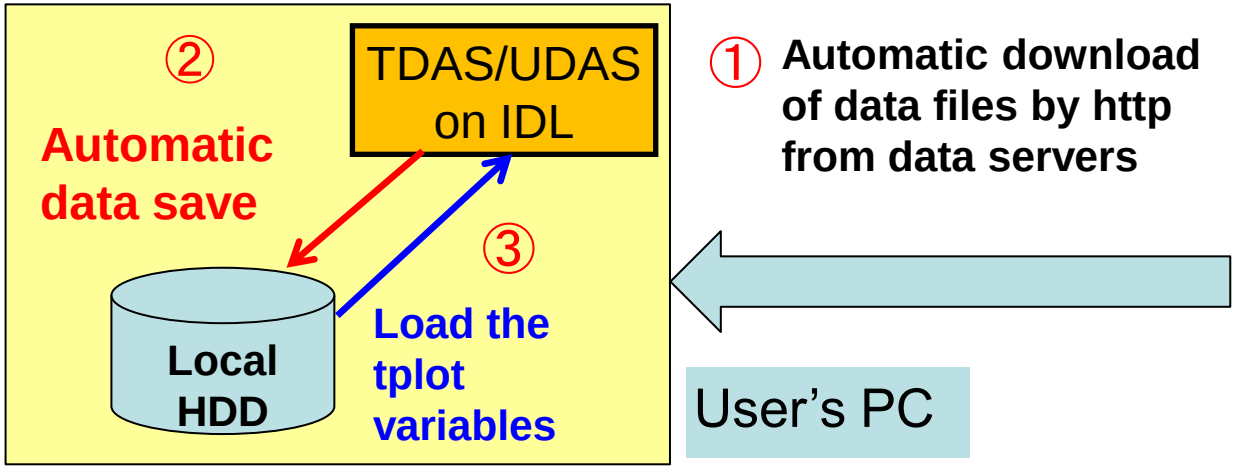

**We have already released the IUGONET metadata database and the integrated data analysis software!**

# 3. Development of analysis software

## 3.1 Characteristics of the UDAS software

**UDAS is a plug-in software of TDAS and includes the load procedures for observation data distributed by the IUGONET institutions.**

```
> timespan, 'yyyy-mm-dd', 13, /day
> thm_load_○○○
> tplot, △△△
```




Data server

- SSL Berkeley
  THEMIS, GBO
- CDAWeb
  OMNI, ACE, Wind, GOES, LANL.
- IUGONET
  Tohoku U
  NIPR
  STEL, Nagoya U
  Hida Obs., Kyoto U
  RISH, Kyoto U
  WDC, Kyoto U
  SERC, Kyushu U

**Users can get and analyze various kinds of observation data without any concerns about data locations and formats.**

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# 3. Development of analysis software

## 3.2 Sample plot using the UDAS software

**2011/3/7-16**

**Geomagnetic field indices**

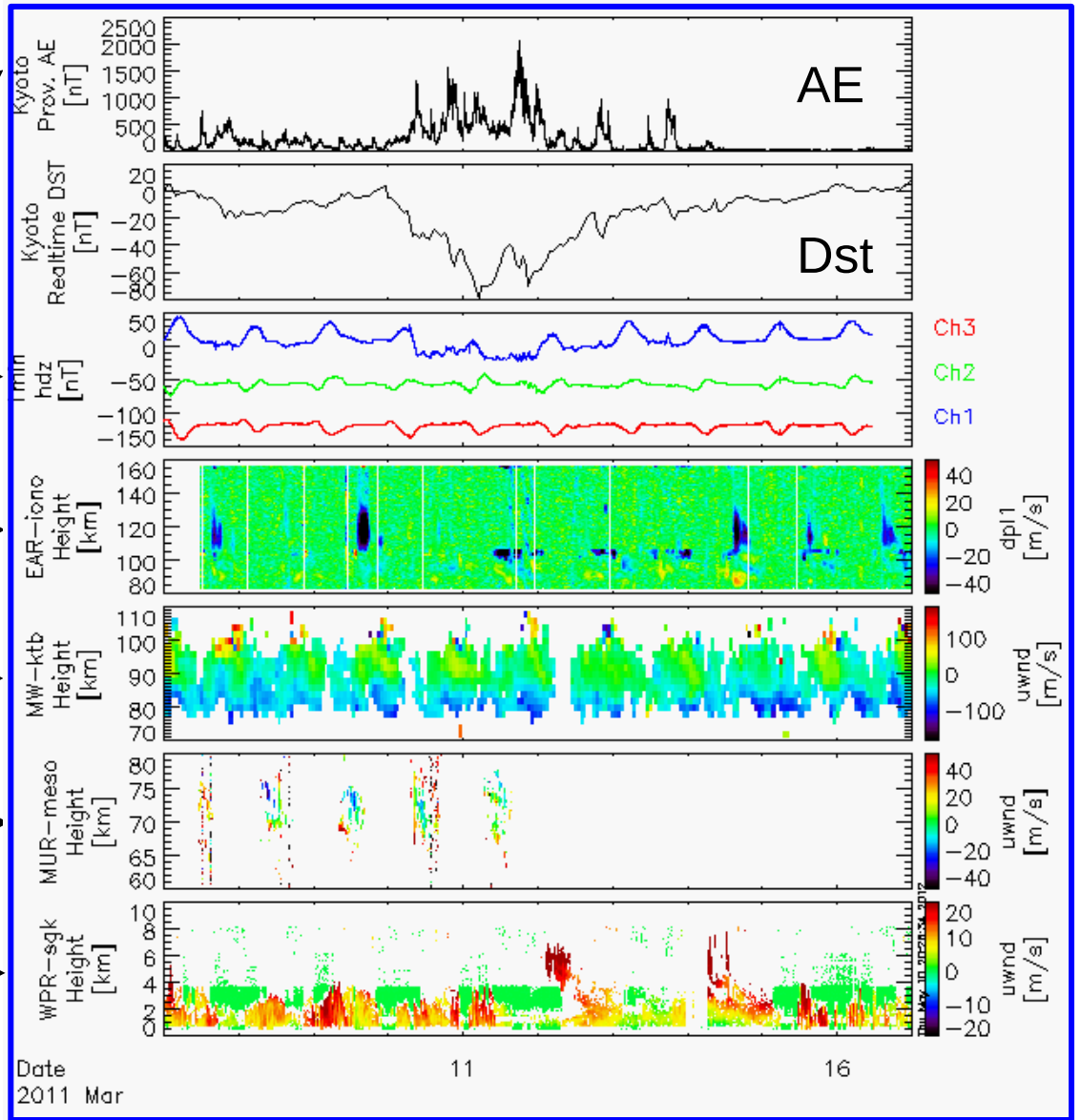
**Global magnetometer network data**

**EAR-FAI**

**Meteor radar**

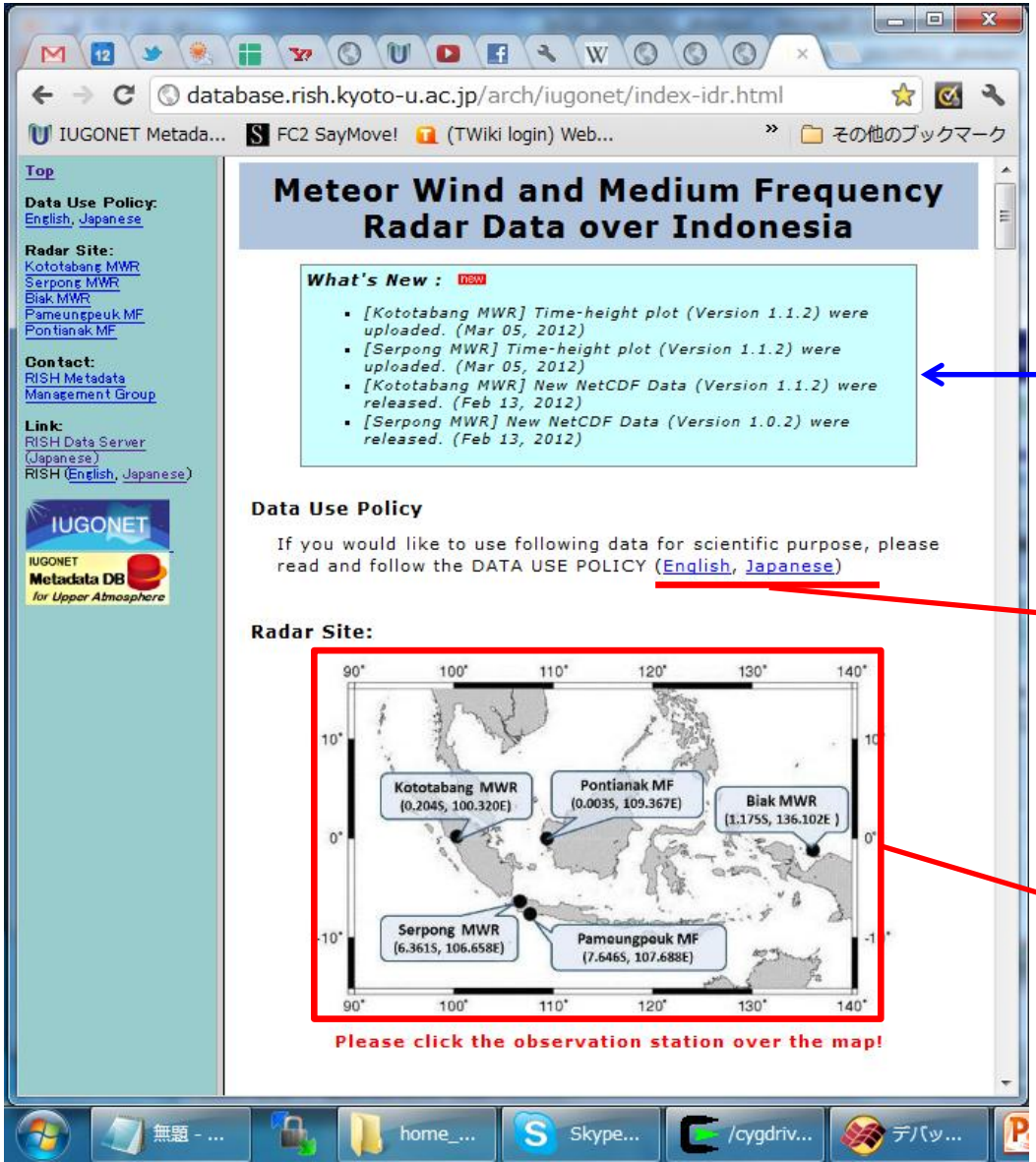
**MU mesosphere**

**LQ-7**



# 4. Database of MF/MW radars in Indonesia

## 4.1 Webpage of MF/MW radar data in Indonesia




**Access URL:**
**http://database.rish.kyoto-u.ac.jp/arch/iugonet/index-idr.html**

**Information of the latest data**

**Jump to the detailed data use policy (English, Japanese).**
**Please read it carefully before you use the radar data.**

**If you click the observation station shown on the map, you can go to the download page of observation data at the selected station.**

# 4. Database of MF/MW radars in Indonesia

## 4.2 Category of MF and MW radar data in Indonesia

### Serpong MW radar

- **Numerical data** (1992/10-1999/08)
  - Wind data (1-day, 1-month files)
    - Text, NetCDF
  - Resolution :
    - 2 km, 60 min (-30-30 min)
    - 4 km, 240 min (-120-120 min)
- **Display data**
  - GIF (1-day, 1-month, 1-year)

### Kototabang MW radar

- **Numerical data** (2002/11-present)
  - Original: Text (1-day file)
  - Wind data (1-day, 1-month files)
    - Text, NetCDF
  - Resolution :
    - 2 km, 60 min (-30-30, 0-60 min)
    - 4 km, 60 min (-30-30, 0-60 min)
- **Display data**
  - GIF (1-day, 1-month, 1-year)

### Pameungpeuk MF radar

- **Numerical data** (2004/03-present)
  - Binary (1-day file)
  - NetCDF (1-day file)

### Pontianak MF radar

- **Display data** (2010/02-2011/05)
  - PNG (1-day and 1-month files)

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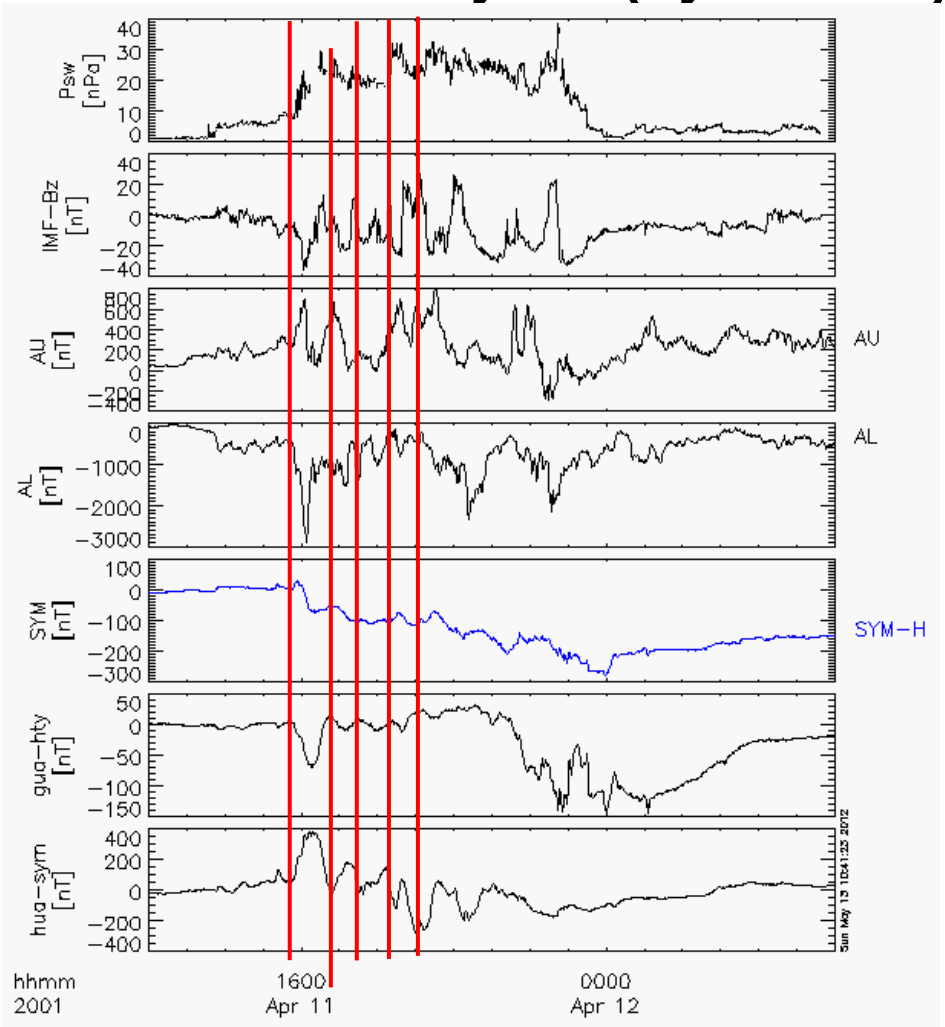
# 5. Example of upper atmospheric researches

## ●Global geomagnetic field variation and ionospheric disturbance dynamo during geomagnetic storms.

**Leader: Dr. Hayashi (Kyoto Univ.)  Joint research program of NIPR**




**[Purpose of this study]**

**To clarify the origin of global magnetic field variations during geomagnetic storms using solar wind and magnetic field observations.**

**In this case, eastward and westward equatorial electrojets are enhanced on the dayside and nightside, respectively, at the onset of geomagnetic storm.**

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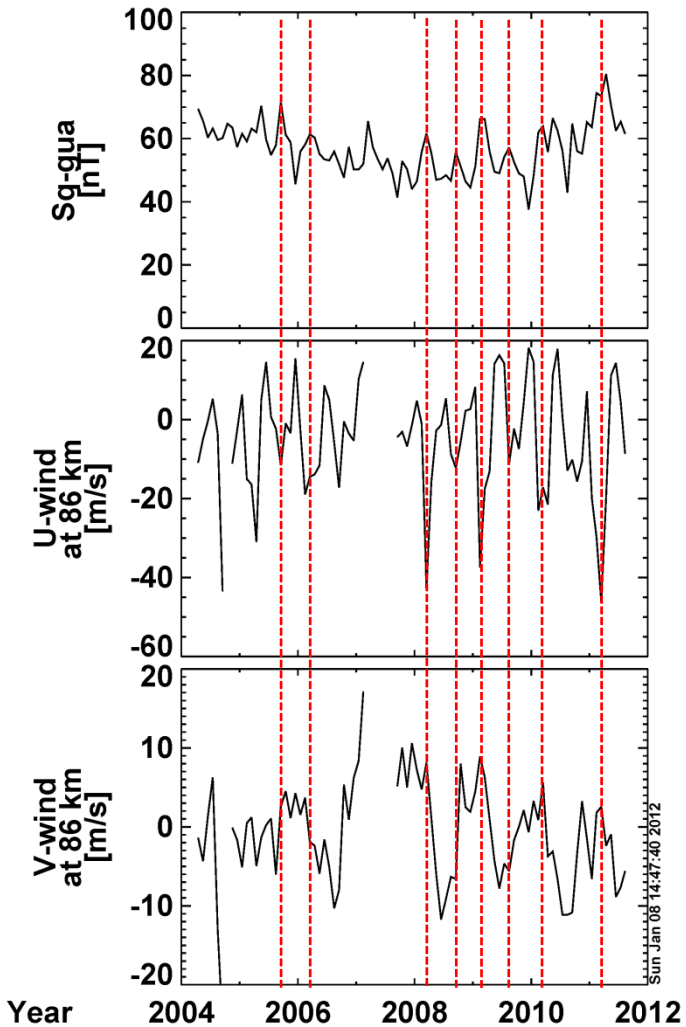
# 5. Example of upper atmospheric researches

- Long-term variation of upper atmosphere as seen in the amplitude of solar quiet (Sq) daily variation.

**Leader: Dr. Shinbori (Kyoto Univ.)  Joint research program of STEL**





**[Purpose of this study]**

**To clarify the origin of long-term variation of Sq amplitude from correlation analysis between geomagnetic field and wind in the MLT region.**

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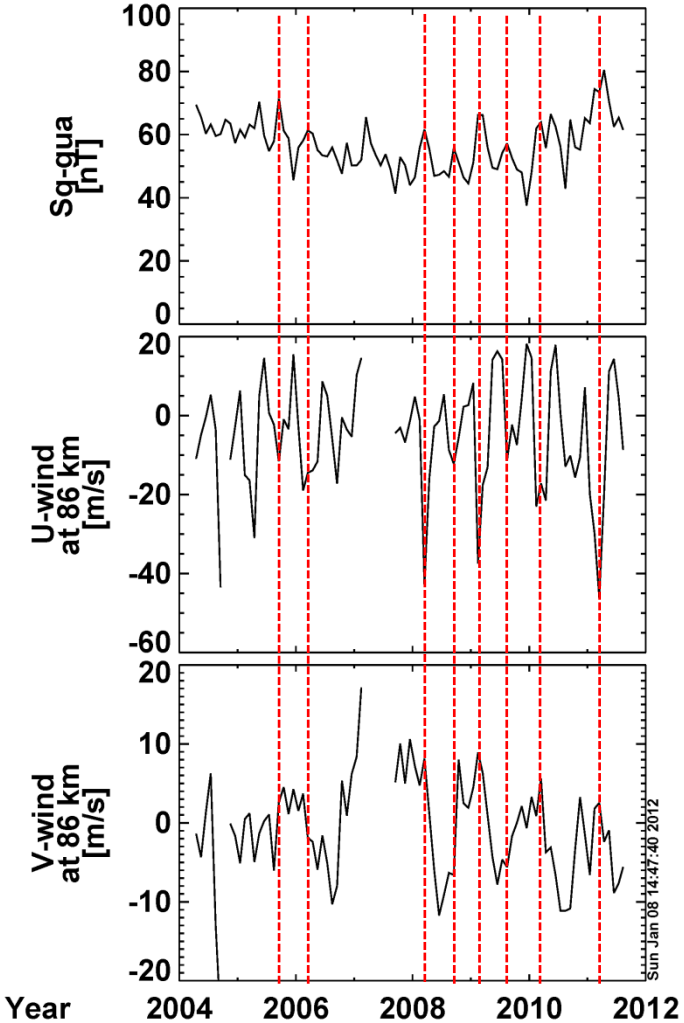
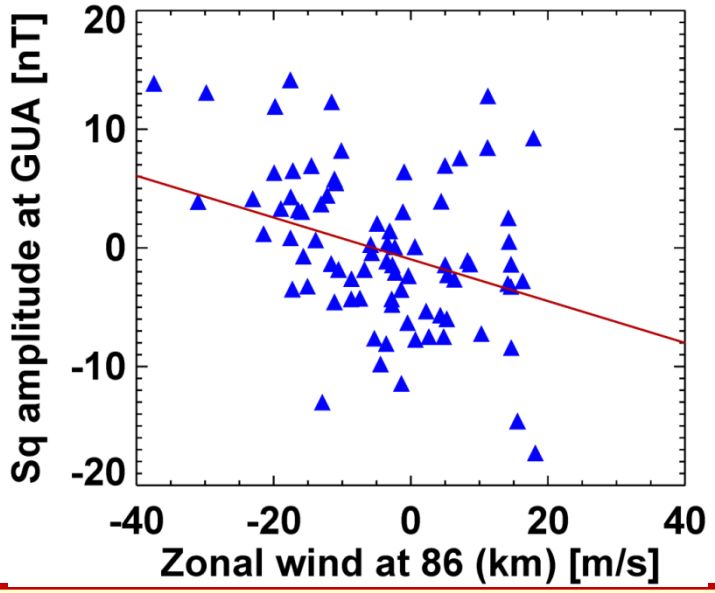
# 5. Example of upper atmospheric researches

- Long-term variation of upper atmosphere as seen in the amp litude of solar quiet (Sq) daily variation.

**Leader: Dr. Shinbori (Kyoto Univ.)  Joint research program of STEL**




**The Sq amplitude tends to enhance when zonal wind is directed westward.**

**This result suggests that the MLT wind contributes to ionospheric dynamo which produces ground magnetic field variations.**

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# 6. Summary

- **The IUGONET project (http://www.iugonet.org) builds metadata database and data analysis software (UDAS) to promote effective use of upper atmospheric data taken by various ground-based observations.**
- **UDAS is a plug-in software of TDAS and provides the load procedures for the various ground-based observational data distributed by each institution in the IUGONET project.**
- **We promote long-term variation of upper atmosphere using various kinds of observation data in order to evaluate a capability of our developed products.**
- **The IUGONET products have been released!**

**Metadata database : http://search.iugonet.org/iugonet/**

**Analysis software : http://www.iugonet.org/en/software.html**

**We welcome your feedback**